

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 November 2001 (22.11.2001)

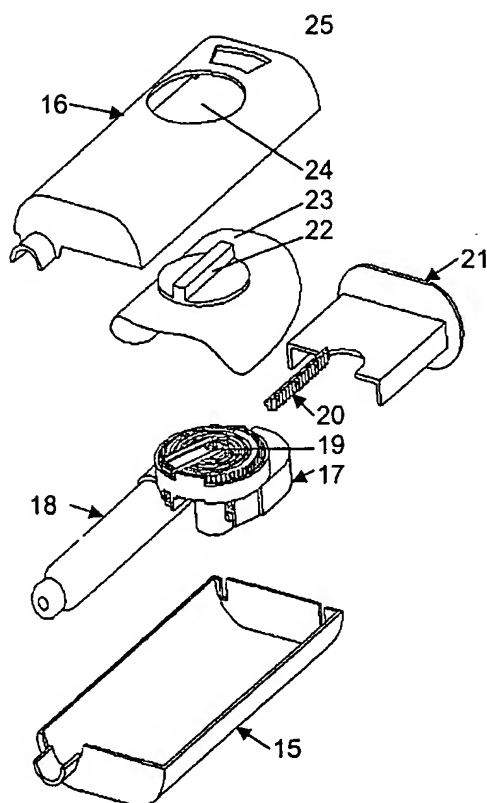
PCT

(10) International Publication Number
WO 01/87386 A1

- (51) International Patent Classification⁷: **A61M 5/315** (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (21) International Application Number: PCT/DK01/00336
- (22) International Filing Date: 14 May 2001 (14.05.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
PA 2000 00799 18 May 2000 (18.05.2000) DK
- (71) Applicant: NOVO NORDISK A/S [DK/DK]; Novo Allé, DK-2880 Bagsværd (DK).
- (72) Inventors: STEENFELDT-JENSEN, Søren; Holmevænget 2B, DK-2970 Ballerup (DK). MØLLER-JENSEN, Peter; Svenstrupvej 6, DK-2970 Hørsholm (DK).
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: DOSE DISPLAY FOR INJECTION DEVICE



(57) Abstract: A dose display for a medicine administration device in which rotation of a dose setting actuator (22) is transmitted to a display means comprises a flexible disc (23) carrying numbers in a band along its perimeter, which numbers are in accordance with the set dose presented in a window in a wall of the device to show said dose. During its rotation the disc (23) is deflected to follow an inner contour of the device to attain a cylindrical shape having a generatrix extending in the axial direction of the injection device and perpendicular to the axis of rotation of the disc.



WO 01/87386 A1

WO 01/87386 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Dose Display for Injection Device

The invention relates to injection devices of the kind by which set doses are apportioned from a cartridge containing a volume of medicine sufficient for several doses. Such devices are often designated as "pens" and may be designed as a pen to be carried by a clip in a pocket the same way as a fountain pen. However, the injection devices need not necessarily have a circular cross section but may have an elongated tubular shape with a more or less rectangular cross section. More specifically the invention relates to a display for such an injection device.

The dose is set by operating a dose setting actuator and the set dose is shown on a display either by a pointer pointing at a number indicating the size of the dose or by a number being presented in a window or on an electronic display.

As the size of the injection device commonly is minimised to make it easy for the user to bring the device with him in a pocket the restricted size of the device sets a limit to the size and thereby to the readability of the numbers in the display.

In EP 327910 a scale showing numbers up to 18 is provided along a perimeter of the device. A pointer points at this scale and by doses larger than 20 units which are set by rotating the dose setting element more than 360°, the size of the dose must be calculated by reading and adding the showing on to different scales. The device only allows settings in step of two units, i. e. 10 numbers are printed along the perimeter and the maximum size of each number consequently is smaller than a tenth of the perimeter.

The two-scale reading of the dose is avoided where the numbers are printed along a helical drum surface of which the part carrying the number indicating the set dose is presented in a window as in 608343, however the numbers of steps per turn of the dose setting member still puts a limit on the height of each written number, if the number of steps per turn are low the width of the numbers will be correspondingly small.

In EP 554 996 numbers having a height of up to one tenth of the perimeter of the injection device without any restrictions of the width of the digits of the number is obtained by using a counter having a number drum for each digit, i.e. "1" counting drum and a "10" counting drum. If wanted a "100" counting drum may be added and so on. The numbers on the count-

ing drums may all be up to one tenth of the perimeter of the drum or $1/10 \times \pi \times d$ where d is the diameter of the counting drum which almost corresponds to the inner diameter of the injection device.

- 5 If an electronic display is used the mechanical movement of the dose setting parts does not set any limit to the size of the display. However, the mechanically working displays are appropriate especially for disposable syringes as the display may be made from the same materials as are the syringe whereby the syringe may easier be disposed of in a way which is environmentally acceptable.

10

Consequently it is an object of the invention to provide a mechanical display by which still larger numbers are allowed.

- 15 A dose display, in which rotation of a dose setting actuator is transmitted to a display means carrying numbers which are in accordance with the set dose presented in a window in a wall of an injection device, is according to the invention characterised in that it has at least one flexible disk which is driven by the dose setting actuator and which in a band along its perimeter carries numbers which can, depending on the rotational position of the disc, be presented in the window to show a set dose, the disc being deflected to follow an inner contour
20 of the device to attain a cylindrical shape with a generatrix extending in the axial direction of the injection device and perpendicular to the axis of rotation of the disc.

- If a disc is folded so that diametrical opposite points of its perimeter just meet, each digit along the perimeter can be made about three times as high as corresponding digits written
25 on a drum having a diameter corresponding to the diameter of the tube formed by the folded disc. If the diametrical opposite edges are allowed to overlap the digits may be still higher.

- Two discs may be placed with their axis parallel and in a distance less than the diameter of the discs away from each other so that the discs overlap each other to make it possible to
30 show a two-digit number. In that case the disc overlapping the other must be transparent. Alternatively the overlapping disc can be provided with windows wherein the showing of the digits on the overlapped disk can be seen. However, this construction will weaken the disc.

- The discs may be provided with a perforation along a circle concentric with the digit band.
35 This perforation is designed to be engaged by transporting sprockets in order to rotate the

disk in accordance with rotation of the dose setting member. The perforation may appropriately comprise a number of holes at least corresponding to the number of digits along the perimeter of the disc.

- 5 In a preferred embodiment one foldable disk is fixed to the dose setting element to rotate with this element and the numbers from zero to the maximum dose which can be set are printed consecutively along the perimeter of the foldable disk to be presented in a window to indicate the set dose.
- 10 In the following the invention is described in further details with references to drawing, wherein

Figure 1 shows schematically a display formed by two foldable disks,

- 15 Figure 2 shows schematically in an exploded perspective how the disks of figure 1 can be placed in a device and be driven by a sprocket wheel,

Figure 3 shows another device in which only one foldable disk is used.

20

- Figure 1 shows schematically a two-digit display device comprising a disc 1 showing the "ones" and a disc 2 showing the "tens". The discs have consecutive numbers written along their perimeter. The shown "ones" disc 1 has the numbers from 0 to 9 written in two consecutive series, each series of number extending over half the perimeter. The other disc 2 showing the "tens" has a number of numbers written depending on the maximum dose which it is intended to make readable in a display window 3. In figure 1 the numbers from 0 to 6 are shown making the display able to show doses from 0 to 69 units. The numbers on the "tens" disc 2 has the same size as the numbers of the "ones" disc 1 and each number takes up 1/20 of the perimeter. Both discs 1 and 2 are provided with a centre hole 4 by which the discs can be journaled on a pair of pivot pins placed at a distance smaller than the diameter of the discs away from each other. Thereby the discs 1 and 2 will overlap each other and the digits of the disc placed to the left will in the display be shown to the right of the digits of the disc placed to the right. The discs are made of a transparent material and consequently the digits of the disc overlapped by the other will be visible through the transparent disc. Along a
- 25
- 30

circle concentric with the perimeter each disc is provided with sprocket holes 5 by which the disc by a sprocket wheel can be rotated about the pivot pin through its centre hole 5.

Figure 2 shows schematically a part of a pen shaped device wherein the disks in figure 1 can be mounted. A housing part 6 is provided with a window 7 wherein numbers along the perimeter of the foldable discs 1 and 2 can be shown when these disks are mounted with their centre holes fitting over a pair of pivot pins 8 and 9 provided on the inner wall of the housing part 6 on each side of the window 7. A sprocket drum 10 having ten sprockets 11 spaced along the perimeter of a first end and one sprocket 12 at the perimeter of the other end is mounted in the device partly encompassed by the disks and with its sprockets 11 engaging the sprocket holes 5 in the "ones" counting disk 1. The other end of the sprocket drum 10 lies opposite the sprocket holes 5 of the "tens" counting disk 2 so that the one sprocket 12 at this second end engages a sprocket hole in this disk 2 when the "ones" counting disk 1 shows a "9" in the window 3. When the showing of the "ones" counting disk 1 in the window 3 changes from "9" to "0" the "tens" counting disk is advanced to shift its showing from one of the numbers along its perimeter to the subsequent number. The sprocket drum 10 is coupled to a not shown dose-setting member in the device to be appropriately rotated when this dose-setting member is operated. After mounting of the disks 1 and 2 the shown part of the device is closed by another part 13 fitting onto the part 6.

20

Figure 3 shows another embodiment of a device having a flexible dose display disk. The shown device, which is of the type wherein the slim design is left in favour of a short device, has a housing comprising a lower part 15 and an upper part 16 encompassing a dose setting and injection module 17 by which a dose can be apportioned from an ampoule 18.

25

The dose setting and injection module 17 can be operated for dose setting by transmitting a rotational movement to the module at the centre 19 of the module, and a set dose can be injected by transmitting a force to the module 17 through a rack 20 carried by an injection button 21 which is mounted in the housing.

30

A rotatable dose setting grip 22 is mounted to the centre 19 of the dose setting and injection module 17. A flexible disc 23 is mounted to the dose setting grip 22 concentric with this grip to be rotated with this grip. Due to its flexibility the disc will follow the inner contour of the parts 15 and 16 forming the housing and. The upper part 16 of the housing is provided with a cut out 24 for the dose setting grip 22 and with a window 25 through which not shown

35

numbers along the perimeter of the flexible disc 23 can be read. The not shown numbers on the disc shows the dose set by rotating the grip 22. The module 17 may further be so designed that the grip is rotated back to its zero position when a set dose is injected by operation of the injection button 21 and the disc 23 will consequently currently in the window 25

5 show how much of the set dose is left to inject.

Claims

1. A dose display in which rotation of a dose setting actuator is transmitted to a display means carrying numbers which are in accordance with the set dose presented in a window in a wall of an injection device, characterised in that it has at least one flexible disc which is driven by the dose setting actuator and which in a band along its perimeter carries numbers which can, depending on the rotational position of the disc, be presented in the window to show a set dose, the disc being deflected to follow an inner contour of the device to attain a cylindrical shape having a generatrix extending in the axial direction of the injection device and perpendicular to the axis of rotation of the disc.
2. A dose display according to claim 1, characterised in that the flexible disc is mounted to the dose setting actuator to rotate with this actuator.
3. A dose display according to claim 1 characterised in that it has two discs placed with their axis parallel and in a distance less than the diameter of the discs away from each other so that the discs overlap each other to make it possible to show a two-digit number, the disc overlapping the other being transparent to allow reading of the numbers on the overlapped disc through the overlapping disc.
4. A dose display according to claim 3 characterised in that 1 the discs are each provided with a perforation along a circle concentric with the digit perimeter, the perforation being designed to be engaged by transporting sprockets on a drum driven by the dose setting actuator in order to rotate the disk in accordance with the dose set.
5. A dose display according to claim 4 characterised in that the perforation comprises a number of sprocket holes corresponding to the number of digits along the perimeter of the disc.

1/2

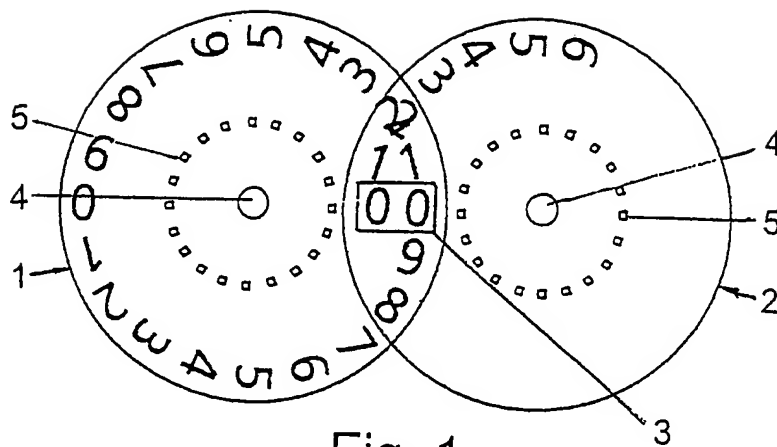


Fig. 1

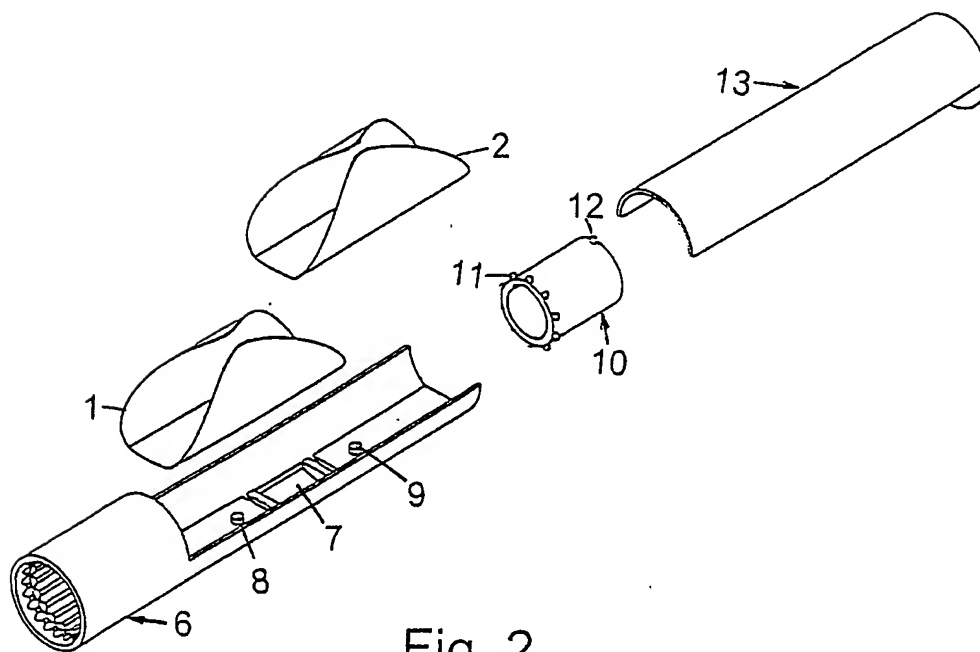


Fig. 2

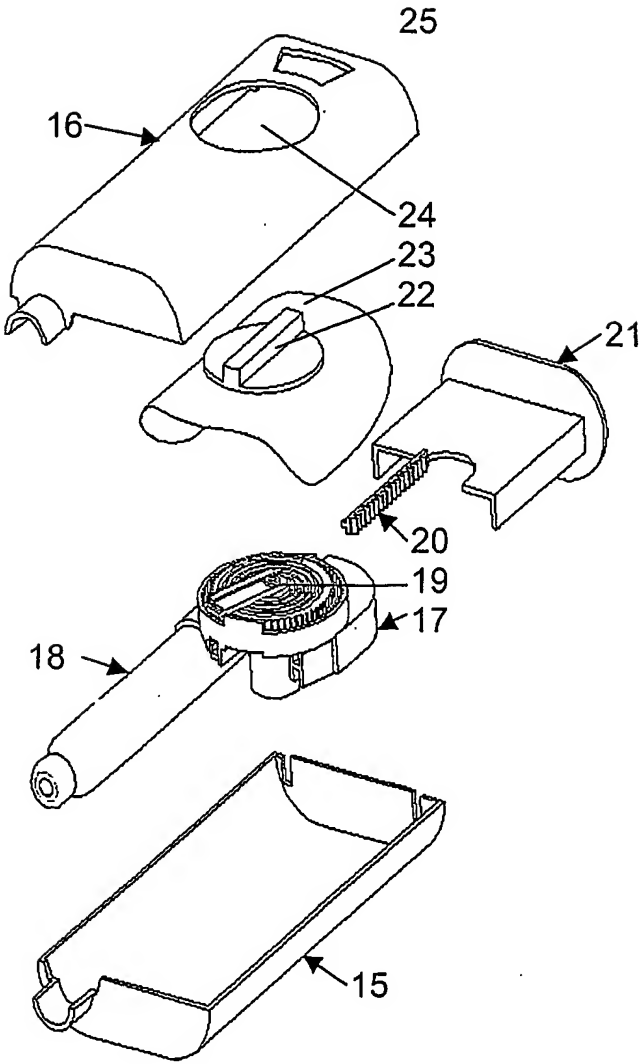


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00336

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 5/315

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0554996 A1 (BECTON DICKINSON AND COMPANY), 11 August 1993 (11.08.93) --	1-5
A	WO 8907463 A1 (D.C.P. AF 1988 A/S), 24 August 1989 (24.08.89) --	1-5
A	WO 9307922 A1 (NOVO NORDISK A/S), 29 April 1993 (29.04.93) --	1-5
A	WO 9311813 A1 (MICRO DOSE PHARMA), 24 June 1993 (24.06.93) -----	1-5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

29 August 2001

20. 09. 2001

Name and mailing address of the International Searching Authority
European Patent Office P.B. 6818 Patentlaan 2
NL-2280 HV Rijswijk
Tel(+31-70)340-2040, Tx 31 651 epo nl,
Fax(+31-70)340-3016

Authorized officer

JACK HEDLUND/E1s
Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/08/01

International application No.
PCT/DK 01/00336

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0554996	A1	11/08/93	CA	2088110 A,C	05/08/93
				DE	69305376 D,T	20/03/97
				JP	1903543 C	08/02/95
				JP	5337179 A	21/12/93
				JP	6024599 B	06/04/94
				US	5279585 A	18/01/94

WO	8907463	A1	24/08/89	AT	74777 T	15/05/92
				AU	618581 B	02/01/92
				AU	3066689 A	06/09/89
				BR	8907240 A	05/03/91
				CA	1305003 A	14/07/92
				CN	1025719 B	24/08/94
				CN	1035055 A	30/08/89
				CS	8900905 A	16/12/92
				CZ	278561 B	16/03/94
				DD	283332 A	10/10/90
				DE	68901190 D	00/00/00
				DK	69288 A	11/08/89
				DK	166948 B	09/08/93
				EP	0327910 A,B	16/08/89
				ES	2030541 T	01/11/92
				FI	94930 B,C	15/08/95
				FI	903893 D	00/00/00
				GR	3004398 T	31/03/93
				HR	930507 A,B	30/04/95
				HU	54064 A	28/01/91
				HU	206272 B	28/10/92
				HU	891454 D	00/00/00
				IE	61515 B	16/11/94
				IL	89189 A	27/02/94
				JP	2726536 B	11/03/98
				JP	3503129 T	18/07/91
				KR	9615612 B	18/11/96
				MX	170604 B	01/09/93
				NO	166519 B,C	29/04/91
				NO	903508 A	09/10/90
				NZ	227895 A	26/03/91
				PT	89669 A,B	04/10/89
				RU	2053798 C	10/02/96
				SI	8910315 A	30/04/97
				SK	278253 B	05/06/96
				US	4973318 A	27/11/90
				YU	31589 A	30/06/91
				ZA	8900902 A	25/10/89

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/08/01

International application No.

PCT/DK 01/00336

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9307922	A1	29/04/93	AT	160946 T	15/12/97
				AU	662021 B	17/08/95
				AU	2795192 A	21/05/93
				CA	2119913 A	29/04/93
				DE	69223521 D,T	18/06/98
				DK	175491 D	00/00/00
				DK	608343 T	24/08/98
				EP	0608343 A,B	03/08/94
				ES	2112915 T	16/04/98
				GR	3026174 T	29/05/98
				JP	3130939 B	31/01/01
				JP	7500039 T	05/01/95
				RU	2091087 C	27/09/97
				US	5626566 A	06/05/97
WO	9311813	A1	24/06/93	AU	3356993 A	19/07/93
				FR	2684880 A,B	18/06/93